

1 Claims:

1. An electrochemical cell comprising a cathode, an electrolyte in ionic contact with said cathode, and an anode in physical contact with said electrolyte, wherein
said anode comprising a controlled release anode composition that comprises at least a first anode active material and at least a first controlled release agent in physical contact thereto for tentatively isolating said first anode active material from said electrolyte in the beginning of a cell operation for a delayed oxidation of said first anode active material.
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2. The electrochemical cell as set forth in claim 1, wherein said anode further comprises an initial-stage anode active material in direct contact with said electrolyte.
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3. The electrochemical cell as set forth in claim 1 or 2, wherein said cathode comprises an oxygen electrode and said either first or initial-stage anode active material comprises a metal element so that said cell constitutes a metal-air battery.
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4. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material comprises a metallic element selected from the group consisting of lithium, magnesium, aluminum, titanium, manganese, iron, chromium, nickel, and zinc.
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5. The electrochemical cell as set forth in claim 1 or 2, wherein said controlled release agent contains a material selected from the group consisting of a polymer, a ceramic, a glass, a carbon, an organic, a metallic material, and combinations thereof.
6. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is in a form of fine particles that are coated, plated, embedded or encapsulated with said controlled release agent.
7. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is in a fibrous, plate-like, disc-like, rod-like, or needle-like form which is coated, plated, embedded

1 or encapsulated with said controlled release agent in such a way that said first anode active
material is separated from said electrolyte during an initial stage of a cell operation.

8. The electrochemical cell as set forth in claim 2, wherein said first anode active material
differs in chemical composition from said initial-stage anode active material.

6 9. The electrochemical cell as set forth in claim 2, wherein said initial-stage anode active
material comprises zinc and said first anode active material contains a metallic element selected
from the group consisting of lithium, magnesium, aluminum, titanium, manganese, iron,
chromium, nickel, and zinc.

11 10. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material
is coated or encapsulated with said first controlled release agent by a technique selected from the
group consisting of electroplating, electrodeless coating, electrochemical deposition, physical
vapor deposition, chemical vapor deposition, plasma deposition, organic phase separation,
surface polymerization, solution coating, solvent casting, fluidized bed coating, thermal spraying,
solution spraying, and combinations thereof.

16 11. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material
is coated or encapsulated with said first controlled release material comprising a metal having an
electromotive force smaller than the electromotive force of said first anode active material but
greater than the electromotive force of an oxygen half cell.

21 12. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material
is fully coated or encapsulated with said first controlled release agent, said agent comprising a
metal with a small electromotive force selected from the group consisting of nickel, tin, lead,
antimony, bismuth, and indium.

13. The electrochemical cell as set forth in claim 1 or 2, wherein controlled release is achieved
through the mechanism selected from the group consisting of desorption, diffusion, erosion, wear

1 or destruction of a barrier material, degradation, chemical reaction, hydrolysis, thermodynamic dissociation, and combinations thereof.

14. A multiple-cell battery assembly comprising a plurality of electrochemical cells, wherein at least one of said cells is a cell as defined in claim 1 or 2.

6 15. The electrochemical cell as set forth in claim 1 or 2, wherein said electrolyte is substantially free from a liquid during a cell storage period and said cell is actuated when a liquid is added to said electrolyte.

16. The electrochemical cell as set forth in claim 15, wherein said liquid comprises water.